

APPLICATOR BRUSHES AND METHOD FOR USING SAME

BACKGROUND OF THE INVENTION

5 1. Field of the Invention

10 The present invention relates generally to brushes and applicators. More particularly, the present invention relates to bristles, fibers and filaments that can be used in brushes and/or applicators, especially for cosmetic use. In particular, the bristles, fibers and filaments are made of polylactide polymer or polymer resin that, in turn, is derived from natural, renewable sources, such as plants.

15 2. Description of the Prior Art

20 Applicator brushes are used to apply a variety of materials, such as, for example, hair dyes, medicaments, paints, toothpastes and cosmetic eyeliner, eyeshadow, mascara, nail polish, powder, and rouge.

The broad purpose of an applicator brush is to pick up an adequate supply of a material from a container, carry it from the container to an application site, and apply the material

uniformly and easily to the application site. More particularly, the applicator brush must meet several mechanical and aesthetic requirements. First, the applicator brush should have a certain stiffness or resiliency, yet have smooth feedback. Second, the applicator brush should have an affinity for the composition it is being used to apply, yet withstand contaminants, such as skin oils and environmental odors. Third, the applicator brush should have high wear resistance, ultraviolet light stability, elastic recovery, twist retention, and a pleasant, soft feel. For cosmetic brush applicators that are used for application of cosmetics, the pleasant, soft feel should include a silky and soft feel to the user's body.

Of course, the importance of these mechanical and aesthetic requirements will vary depending upon the intended use of the applicator brush. Along these lines, bristles, fibers and filaments have been developed with variations in characteristics, such as, for example, density, cross-section, number of twists, slip characteristics, wicking, shape, and core size. The variations in characteristics primarily depend on the intended use of the brush.

Typically, conventional applicator brush bristles are made from nylon, polyester, polyether-block amides, and/or

polytetraflouroethylene. Brush bristles made from these materials may have an acceptable degree of strength, stability, and wear resistance, however the bristles made with nylon and these other petrochemical-based synthetic materials consume a large amount of energy or fuel. Specifically, nylon is made through the energy intense processes from hydrocarbon petroleum fuel stock. The source of supply of this stock can be limited and unpredictable, and the processes are expensive. Moreover, nylon and these other petrochemical-based synthetics biodegrade extremely slowly, if at all.

Thus, there is a need for applicators with bristles, fibers, and filaments (hereinafter collectively referred to as "bristles") that provide the same or improved mechanical and aesthetic properties, namely are formable into a broad range of bristle densities, cross-section and cross-sectional dimensions, various number of twists, unique shapes, and core types (e.g., hollow, solid, or filled) and have the desired slip and wick characteristics, yet have a source of material that is reliable, less expensive to make, and biodegradable. The bristles of the present invention achieve all of the above, and they are believed to be much less expensive since thirty to fifty percent less fossil fuel is used to produce these bristles versus the above noted conventional bristles.

The above need is achieved by the present invention that uses a polylactide polymer or polymer resin as the bristles for an applicator brush.

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U.S. Patents Nos. 5,525,706, 5,807,973, 5,922,832, 6,005,068, 6,093,791, and 6,111,060 are assigned on their faces to Cargill, Inc. and describe uses of polylactide polymer for films, foams, and nonwoven fabrics. In addition, polylactide polymers have been used in diapers, disposable razor handles, hospital gowns, personal hygiene articles, surgical drapes, and sanitary napkins, as well as for use in carpet, clothing, packaging for food and cosmetics, plastic film for candy wrappers, and window envelopes.

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is a biodegradable polylactide polymer or polymer resin made from renewable sources.

It is still another object of the present invention to
5 provide such an applicator or brush in which such natural-based bristles can be formed into a broad range of dimensions, sizes, and shape.

It is still a further object of the present invention to
10 provide such an applicator and/or brush that is particularly suited for cosmetic use.

These and other objects and advantages of the present
invention are provided by an applicator brush that has natural-
15 based bristles made from a plant-based polymer, such as polylactide polymer, that is derived from renewable, natural plant sources, such as corn, wheat, and sugar beets.

BRIEF DESCRIPTION OF THE DRAWINGS

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Figure 1 is a preferred embodiment of a mascara applicator brush according to the present invention;

Figure 2 is an embodiment of a nail lacquer brush according to the present invention;

Figure 3 is an embodiment of a flat blush brush according to the present invention;

Figure 4 is an embodiment of a blush/makeup brush according to the present invention;

Figure 5 is an embodiment of an eyeliner brush according to the present invention;

Figure 6 is an embodiment of a toothbrush according to the present invention; and

Figure 7 is an embodiment of a hair brush according to the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Referring to Fig. 1, there is provided a preferred embodiment of the present invention, namely a mascara applicator or brush generally represented by reference numeral 1. As used hereinafter, "applicator" shall include an applicator and/or a

brush. Also, the present invention includes all types of applicators that are used to apply liquids, gel-type and/or semi-solid materials onto any substrate. For example, the applicator of the present invention can be a hair brush, a hair dye brush, a medicament brush, a paintbrush, and a toothbrush. Perhaps more importantly, applicator 1 can be used as a cosmetic applicator brush to apply a variety of cosmetics, such as eyeliner, eyeshadow, lipstick, lip gloss, mascara, nail polish and/or lacquer, blush and/or makeup, powder, rouge, and nail cosmetics, such as polishes and enamels, to a human.

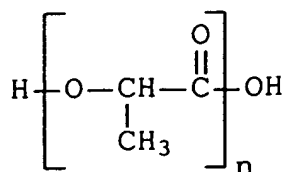
Again referring to Fig. 1, applicator 1 has a handle 16 and a bristle portion 20. When applicator 1 is adapted for use in applying cosmetic compositions, such as mascara, it is preferred that handle 16 has a rod 14 extending therefrom and secured to, or part of, a core 12. Handle 16 is adapted to act as a cap for a cosmetic or mascara container, while rod 14 is adapted to fit within the neck of the container. Core 12 is adapted to receive a plurality of bristles 30. Core 12 is preferably a twisted metallic wire. Bristles 30 are preferably crimped within twisted core 12 and, thereby, flare outward from the core in a multidirectional, radial pattern, which gives the effect of a uniform distribution of bristles 30. Alternatively, bristles 30

may be made to resist crimping, thereby forming a helical array about twisted core 12.

Handle 16 may be made using any material known to the art and suitable for the particular use thereof. Preferably, handle 16 is made of a thermoplastic material, more preferably a plant-based polymer, such as the polylactide polymer discussed below, so that the applicator brush 1 may be completely biodegradable.

10 Bristle portion 20 has one or more bristles 30. The
12 bristles 30 are made from a natural, plant-based polymer. Such
14 plant-based polymers include the following polymers or polymer
16 resins: polylactide (PLA), polycaprolactone (PCL),
18 polyhydroxybutyrate/valerate (PHB/V), polyglycolic acid (PGA),
20 and polymers based on starch or starch derivatives. Bristles
22 formed by copolymerizing and/or coextruding plant-based polymers
24 with materials presently used to form conventional bristles are
also included within the scope of the present invention.

20 Preferably, bristles 30 are made from polylactide polymer.
This polymer has the following general structure:



where n is the average molecular weight from about 10,000 to about 300,000 and preferably at least 50,000 to 250,000.

Preferred polylactide polymers are produced by Cargill Dow.

Several kinds of polylactide polymers are described in U.S.

5 Patent Nos. 5,798,435, 5,981,694, and 5,998,552, which are incorporated herein by reference.

The plant-based polymer is made by the processing of natural renewable sources, such as corn, wheat, sugar beet, or
10 other plants.

The plant-based polymer can be processed into bristles by conventional methods. The processing parameters of the plant-based polymer can be modified to achieve enhanced performance
15 and properties. The plant-based polymers readily accept dyes, additives and fillers, and can be processed readily with other materials that may provide further enhanced bristle performance, properties and processability.

20 A bristle 30 made from a plant-based polymer has increased slip characteristics and increased wicking properties, both of which are desired in an applicator bristle. Also, bristles 30 have been found to have a silky feel, downgagability (which is the ability to make thinner fibers), excellent UV stability,

strong resistance to grease and oil, high aroma and flavor barrier properties, superior moisture wicking, as well as superior twist retention, resilience, stiffness, and elastic recovery. Moreover, the bristles of the present invention are highly environmentally friendly because of their biodegradability.

Bristles 30 that are made from plant-based polymers, especially PLA polymers, can have any shape depending upon their intended use. For example, bristles 30 made from PLA polymer may have one or more cross-sectional portions that are generally flat, circular, square, rectangular, hexagonal, quadrilobal, J-shaped, S-shaped, U-shaped, V-shaped, and/or X-shaped. In cross-sectional view, bristle portion 20 may be straight, tapered, threaded, curved, oblong, arrowhead, comb-shaped or any combination thereof. The ends of the bristles may be split, crimped or straight. In addition, each bristle may have all or a portion that is flared, tapered, grooved, solid, hollow or filled. If grooved, up to five (5) capillary channels may be formed along at least a portion of the length of the bristle surface, with each channel having a depth and width in the range from 0.01 to 0.06 millimeters. Further, bristle 30 may have any number of turns or twists, a broad range of bristle densities, and a large range of cross-sectional dimensions. The bristle

may be natural, dyed or pigmented.

For example, the concentration or density of bristles 30 in
bristle portion 20 is preferably from about 10 to about 65
5 bristles per helical turn of core 12, especially when applicator
brush 1 is a mascara applicator brush. More preferably, the
bristle density is from about 40 to about 60 bristles per
helical turn of core 12. Most preferably, the bristle density
is from about 45 to about 55 bristles per helical turn of core
10 12. This concentration provides an even application of mascara
without forming lumps of mascara on the eyelashes or on bristle
portion 20. Also, the diameter of each bristle 30 is preferably
about 0.01 to about 0.40 mm, more preferably about 0.06 to about
0.25 millimeters.

15 The bristles of the present invention offer a general
improvement over nylon and other petrochemical-based bristles.
For example, they appear to have superior twist retention,
better fold, and better elastic recovery than petrochemical-
20 based bristles. Also, the bristles of the present invention
retain the desired stiffness and resiliency, yet have a silky,
soft feel.

By way of example, additional embodiments of the present invention are shown in Figures 2 to 7. Figure 2 depicts a nail lacquer brush. Figure 3 depicts a flat blush brush. Figure 4 depicts a blush/makeup brush. Figure 5 depicts an eyeliner brush. Figure 6 depicts a tooth brush. Figure 7 depicts a hair brush.

The present invention having been thus described with particular reference to a preferred form thereof, it will be obvious that various changes and modifications may be made therein without departing from the spirit and scope of the present invention as defined in the appended claims.